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SHAUGHNESSEY NO.

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TYPE PRODUCT(S) : I, D, H, F, N, R, S Miticide/Insecticide

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PRODUCT MANAGER NO. G. LaRocca (15)

PRODUCT NAME(S) Abamectin

COMPANY NAME Merck & Company, Inc.

SUBMISSION PURPOSE Proposed EUP for Citrus

SHAUGHNESSEY NO.	CHEMICAL, & FORMULATION	% A.I.

ECOLOGICAL EFFECTS BRANCH
EUP REVIEW

Abamectin

100 Experimental Use Label Information

This is a modification of a previously approved EUP. See EEB review dated October 28, 1985. The modifications are as follows:

- Revised protective clothing statement;
- Deleted 24-hour re-entry interval; and
- 7-day PHI in all four states.

Also, the acreages in California and Florida have been reduced to 1,280 for each state.

100.1 Pesticide Use

Miticide/Insecticide for experimental use on citrus.

100.2 Formulation Information

Active Ingredient

Abamectin: Avermectin B_1 [A mixture of avermectins containing $\geq$ 80% avermectin A_1a, 5-0-demethyl-and $\leq$ 20% avermectin B_1a, 50-demethyl-25-de(1-methylpropyl)-25(1-methylethyl)	2.0%
Inert Ingredients	98.0%

(1 gallon contains 0.15 pound abamectin)

100.3 Application Methods, Directions, Rates

DIRECTIONS FOR USE

Use of this pesticide in any manner inconsistent with the terms of the Experimental Use Permit is a violation of Federal Law.

To evaluate the effects of this product on citrus rust mite, citrus red mite, citrus flat mite, citrus broad mite, citrus bud mite, Yuma spider mite, Texas citrus mite, and other arthropod pests of citrus, apply either as a single spray or in a full season program at the rates given in Table 1. Evaluate applications in 100 to 1000 gallons of water per acre using standard ground equipment designed to deliver accurate sprays. All applications should be made with 0.20 to 0.25 percent oil in the spray mixture or with a minimum of 1.0 gallon of oil per acre.

Table 1. Rates to be Evaluated in the Experimental Program

Crop	Pests	For Concentrate Sprays MK-936 0.15 EC Per Acre	For Dilute Sprays MK-936 0.15 EC Per 100 Gal	Pounds Active Ingredient Per Acre
Citrus (round orange, grapefruit, lemon, lime and mandarine types)	Citrus rust mite	1/3 - 1 1/3 pints	1.05 - 2.1 fl oz	0.00625 - 0.025
	Citrus broad mite			
	Citrus red mite			
	Citrus flat mite			
	Texas citrus mite			
	Citrus bud mite	2/3 - 1 1/3 pints	2.1 fl oz	0.0125 - 0.025
	Yuma spider mite			
	Citrus thrips			

Remarks

a/ Do not apply more than 1000 gals. dilute spray per acre.
b/ For concentrate sprays - adjust the dosage to apply an amount not exceeding that used in a dilute spray.
c/ Do not apply within 7 days of harvest

d/ Do not apply more than 3 sprays in any 12 month period.

Spray Intervals

In single applications, evaluate at a rate given in table 1 to determine the dose needed to give residual control of the target pest indicated. To determine the effects of multiple applications on the total arthropod complex and fruit quality, evaluate a maximum of 3 applications within the rate ranges in full season programs with applications made postbloom (spring), summer and/or fall.

100.4 Target Organisms

Mites

100.6 Proposed EUP Program

100.6.1 Objectives

To determine efficacy of avermectin in controlling citrus mites.

100.6.2 Date, Duration

January 1, 1987 to December 31, 1987.

100.6.3 Amount Shipped, Geographical Distribution

States, Acreages, and Quantity of Material for Proposed Experimental Use of MK-936 on Citrus in 1987

State	Acreage	Range of Rates to be evaluated (lbs ai/A)	Maximum number Application	Maximum Quantity of MK-936 0.15 EC Needed (Gallons)
California	1,280	0.00625-0.025	3	640
Arizona	500	0.00625-0.025	3	250
Florida	1,280	0.00625-0.025	3	640
Texas	200	0.00625-0.025	3	100
	Total 3,260 Acres			1,630 gal*

* For purpose of calculating the quantity of material needed, the maximum rate within the range (0.025 lb ai/A) was used. A total of 1630 gallons of MK-936 0.15 EC (245 lbs ai) is requested for use on a maximum of 3260 acres of citrus treated three times. This figure, therefore, represents an absolute maximum because it assumes that all acreage would be treated and the total acreage would receive three applications at the maximum rate.

Locations of Test Sites in Proposed Experimental Programs:

All citrus producing counties in the States of California, Arizona, Florida, and Texas are to be included.

101 Hazard Assessment

101.1 Discussion

The maximum application rate is 0.025 lbs ai per acre with a maximum number of applications at three per season. Timing is postbloom (spring), summer and/or fall. Aerial or mist treatment is assumed.

Citrus is grown in central Florida, southern Texas Western Arizona, and central-south California. See figure 1.

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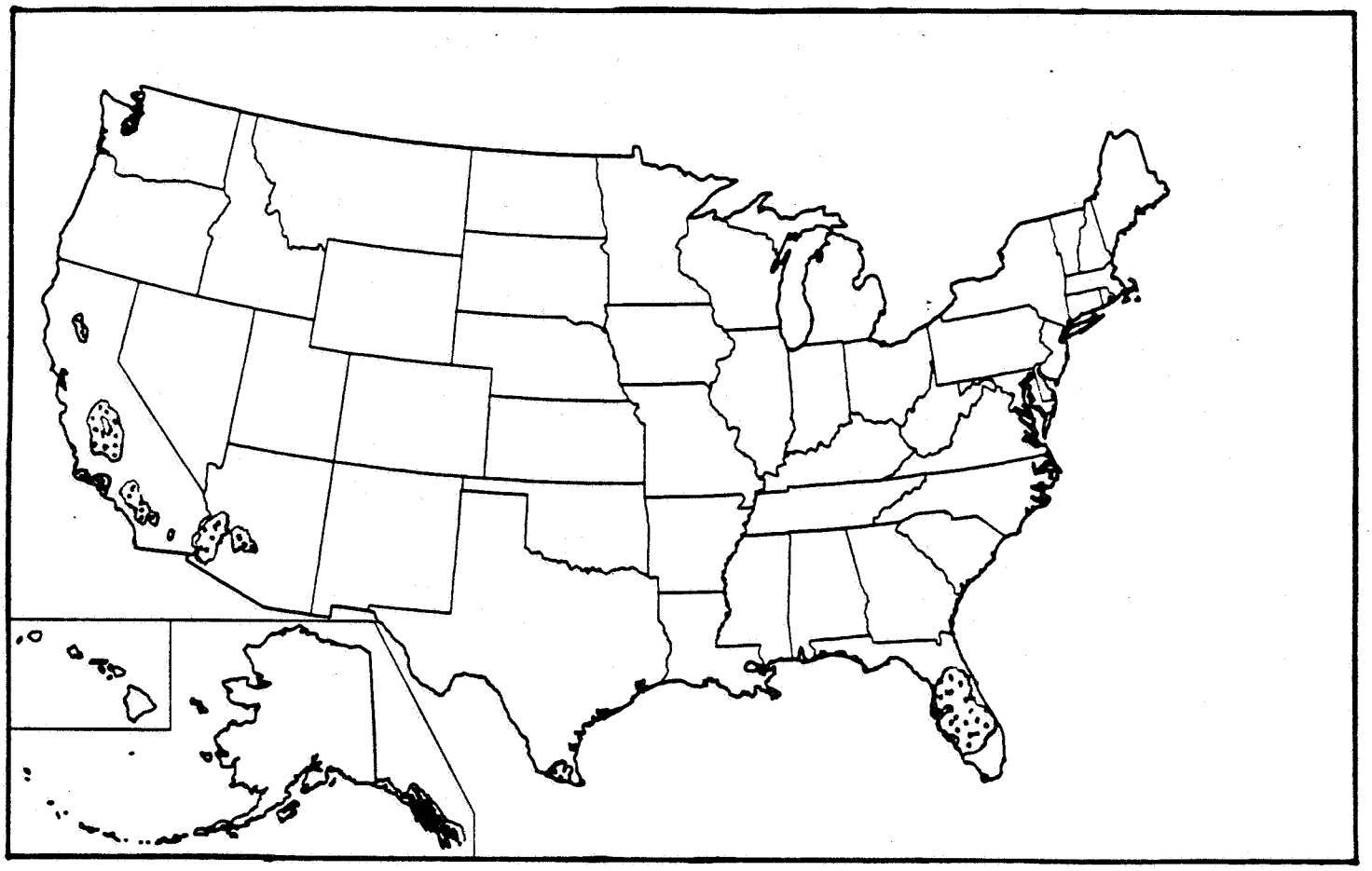

Figure 1 Citrus growing areas in United States.

101.2 Likelihood of Adverse Effects to Non-Target Organisms

Toxicity Information

Birds

Species	Test Mat.	Test Type	Results
Bobwhite quail	91% Tech.	Acute Oral	LD50>2000 mg/kg
Mallard duck	91% Tech.	Acute Oral	LD50=85 mg/kg
Bobwhite quail	91% Tech.	Dietary	LC50=3102 ppm
Mallard duck	91% Tech.	Dietary	LC50=383 ppm
Bobwhite quail	91% Tech.	Dietary	LC50=1417 ppm
Mallard duck	91% Tech.	Dietary	LC50=899 ppm

Mammals

Species	Test Mat.	Test Type	Results
Mouse	Tech.	Acute Oral	LD50=13 mg/kg
Rat	Tech.	Acute Oral	LD50=10 mg/kg
Weanling rat	Tech.	Acute Oral	LD50=1.5 mg/kg
Rat	Tech.	Reproduction	NOEL=0.1 mg/kg/day LEL=0.5 mg/kg/day
Mice	Polar metabolite	Acute Oral	LD50>5000 mg/kg
Mice	Non-Polar metabolite (8,9 isomer of abamectin)	Acute Oral	LD50>48 mg/kg

Fish

Species	Test Mat.	Test Type	Results
Rainbow trout	91% Tech.	96-hour exposure	LC50=3.2 ppb
Bluegill	91% Tech.	96-hour exposure	LC50=9.6 ppb
Bluegill	Tech.	7-day flow-thru	NOEL=2.3 ppb
Channel catfish	91% Tech.	96-hour exposure	LC50=24 ppb
Carp	91% Tech.	96-hour exposure	LC50=42 ppb
Sheepshead minnow	91% Tech.	96-hour exposure	LC50=15 ppb

NOEL=No Observed Effect Level, the highest test level at which no effects were observed.
LEL=Lowest Observed Effect Level, lowest test level at which adverse effects were observed.

Aquatic/Estuarine Invertebrates

Species	Test Mat.	Test Type	Results
Daphnia magna	91% Tech.	48-hour exposure	LC50=0.34 ppb
Daphnia magna	Tech.	48-hour exposure	LC50=0.22 ppb
Daphnia magna	Avermectin B1a	48-hour exposure	LC50=0.42 ppb
Daphnia magna	Polar degradate	48-hour exposure	LC50=4.2 ppb
Daphnia magna	Moderately polar degradate	48-hour exposure	LC50=6.3 ppb
Daphnia magna	Nonpolar degrad.	48-hour exposure	LC50=25.4 ppb
Daphnia magna	thin film polar degradate*	48-hour exposure	LC50=76.7 ppb
Daphnia magna	8a-hydroxy avermectin B1a**	48-hour exposure	LC50=25.5 ppb
Daphnia magna	91.43% Tech.	reproduction	NOEL=0.03 ppb LEL=0.09 ppb
Mysid shrimp	91.43% Tech.	96-hour exposure	LC50=0.2 ppb
Eastern oyster	90.5% Tech.	48-hour embryo-larvae	EC50=430 ppb

* This polar metabolite is the last one formed and is what the parent becomes after about 72 hours.
** Major soil metabolite. This accounts for 20% of the total soil residue.

Plants (algae)

Species	Test Mat.	Test Type	Results
Lemma gibba	91.4% Tech.	14-day exposure	EC50=3.9 ppm
Selanastrum capricornutum	91.4% Tech.	9-day exposure	EC50>100 ppm

Environmental Fate Information

Halflife: Parent is relatively persistent in soil with half-life of 4 to 10 weeks. It does not hydrolyze but photolyzes in water. Photolytic halflife in water is 12 to 24 hours.

Bioaccumulation: is minimal with maximum being 110X in fish, with depuration (loss of accumulated residues from fish body after being placed in uncontaminated water) of 95% in 14 days.

Runoff: should be minimal (1% of applied) because of low solubility.

Terrestrial Exposure

At the proposed rate of application, 0.025 lbs ai/acre, the following residues (ppm) on terrestrial food items are expected.

	short grass	long grass	leafy crops	insects forage	seed pods	fruit
maximum	6	2.8	3.1	1.5	0.3	0.2
typical	3.1	2.3	0.9	0.8	0.1	<0.1

These levels are well below the avian dietary LC50's and are not likely to cause acute effects. The short halflife will preclude chronic exposure and thus long-term effects are not expected.

Table 2 shows a number of mammalian species, their weights, food consumption, and extrapolated LC50's. The extrapolation is based on the rat LD50 of 10 mg/kg. The above residues are lower than the lowest calculated LC50 therefore, this EUP is not likely to have adverse effects on nonendangered mammals.

Aquatic Exposure

Because of its relatively low solubility, 1 percent or less of the applied Abamectin is expected to runoff. In the following scenario, 10 treated acres drains into a 1 acre pond.

0.025	lbs ai/acre
X 10	acres
0.25	lbs ai applied
X 0.01	1% runoff
0.0025	lbs ai loading into pond

The exposure to aquatic organisms would depend on the water depth. The deeper the water, the lower the exposure levels, see the following.

Depth	Exposure (PPB)
6"	1.8
1'	0.9
3'	0.3
6'	0.15

This EUP may cause adverse acute effects, locally, to aquatic or estuarine invertebrates. Chronic effects would be minimal since Abamectin hydrolyzes rapidly to less toxic degradates. The acute effects to nonendangered species would be limited because of the small acreage involved. It is not expected to adversely effect nonendangered fish and molluscs.

Table 2. Table Of Mammalian Food Consumption [1]

SPECIES [2]	BODY WEIGHT GRAMS	DAILY FOOD INTAKE GRAMS	DAILY FOOD INTAKE GRAMS/G [3]	LC_{50} PPM	$LC_{50} = \frac{LD_{50} \times \text{ANIMAL WT}}{\text{FOOD CONS PER DAY}}$
Grazing Herbivores					
Meadow vole	46	28.1	0.61	16.4	
Hispid cotton rat	100	31.2	0.31	32.1	
Eastern Cottontail	312 [4]	224	0.72	13.9	
Swamp Rabbit	1518	641	0.43	23.7	
Jack Rabbit	2043	80	0.04	255.4	
Beaver	12998	393	0.03	330.7	
Deer	24970	606	0.02	412.0	
Cow	181600	4994	0.03		
Granivores					
Old field mouse	13	2.1	0.16	62.0	
Red squirrel	190	13.4	0.07	141.8	
Fox squirrel	1000	38	0.04	263.1	
Omnivores					
House mouse	19	7.6	0.40	25.0	
Deer mouse	18.4	3.6	0.20	51.1	
Whitefooted mouse	26.1	4.3	0.16	60.7	
Marsh rice rat	37	1.7	0.04	217.6	
Raccoon	18160	385	0.02	47.2	
Insectivores					
Masked shrew	3.4		2.8		
Least shrew	5.0	5.5	1.1	9.1	
Water shrew	10.0	10.3	1.0	9.7	
Short-tailed shrew	24		0.53		
Common mole	46.5	28.7	0.62	16.2	
Carnivores					
Least weasel	60	15	0.25	40.0	
Long-tailed weasel	230	49	0.21	153.0	
Bobcat	10090	1000	0.10	100.9	

1/ Table copied from Davis, D.E. and F.B. Golly, 1963. Principles of Mammalogy. Reinhold Publ. Corp. N.Y.
2/ In original table, scientific names only were provided.
3/ When multiplied by 100, yields percent of body weight one animal could consume in one day.
4/ This is low for a rabbit weight, but it is what was in the original table.

101.3 Endangered Species

Terrestrial

This EUP will have no adverse effects on endangered bird species because the low use rate will not result in hazardous residues. Endangered mammal or reptile species would not be affected because the EUP does not involve treatment in areas known to be inhabited by these organisms.

Abamectin does not bioaccumulate to a great extent so secondary hazards will not occur. The bioaccumulation factor of 110x in fish is relatively low compared to other pesticides. Further, bioaccumultion via ingestion of contaminated material is typically much lower (.01) than that which occurs through ambient exposure. It tends to degrade quickly on leaf surfaces to materials shown to be less toxic to mammals.

This EUP would, however, have adverse effects on any endangered aquatic organisms and insects if exposure occurred. Based on available information and telephone conversations (see below), the following endangered species either occur near citrus growing areas, occur in citrus growing counties and have not been eliminated from concern, or depend on sensitive food organisms which occur in citrus producing counties.

Species		Counties, State
Desert pupfish		Riverside, Imperial CA
Smith's blue butterfly		Monterey CA
Kern primrose sphinx moth		Kern CA
Valley elderberry longhorn beetle		Yolo, Sacramento and Solano CA
	Indirect effects	
Everglades kite	(via apple snail)	FL *
Woodstork	(via fish)	FL *
Grasshopper sparrow	(via insects)	FL

* All citrus producing counties are included.

To preclude exposure to susceptible endangered species, the use of Abamectin will be prohibited from the following locations:

State	Counties
California	Riverside Imperial Monterey Kern Yolo Sacremento Solano
Florida	All citrus producing counties

Telephone Conversations

Don Metz, Division of Ecological Services, USFWS, Pheonix, AZ, FTS 261-4720. He indicated that there is no citrus grown near Woundfin habitat.

Don Palmer, Office of Endangered Species, USFWS, Jacksonville, FL, FTS 946-2580. He cold not provide any information on endangered species without specific use locations and could not approve any experimental use of Abamectin in Florida via telephone.

Ed Larimer, Office of Endangered Species, USFWS, Sacremento, CA, FTS 460-4866. He indicated that the unarmored three-spine stickleback in Santa Barbara and Los Angeles Counties would not be affected by this EUP since little citrus is grown in areas adjacent to its habitat. He also indicated that the Smith's blue butterfly is only in Monterey County. Further, the desert pupfish in Riverside and Imperial Counties occurs adjacent to citrus growing areas.

103 Conclusions

The EEB has completed a review of the proposed experimental use of Abamectin on Citrus in Florida, Texas, Arizona and California. Based on available data, this use provides for minimal adverse effects to terrestrial organisms, nonendangered fish and nonendangered mussels and possibly local adverse effects to nonendangered aquatic invertebrates where exposure occurs. These local effects will not cause serious ecological effects and are not considered unreasonable.

To preclude exposure to endangered aquatic organisms and insects, and indirect adverse effects to endangered bird species, the EUP must specifically exclude the following locations.

State	Counties
California	Riverside Imperial Monterey Kern Yolo Sacremento Solano
Florida	All citrus growing Counties

The registrant may propose experimental use of Abamectin in specific counties in Florida. The EEB could then consult with USFWS to determine whether or not those counties contain essential food items for either the everglades kite, woodstork or grasshopper sparrow.

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